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MECHANIZATION OF UNDERGROUND COAL MINING INCREASES IN USSR

NEW MACHINES SPEED EXTRACTION

A. F. Zasyad'ko

The USSR coal industry has achieved the degree of mechanization fixed by the postwar Five-Year Plan for underground coal mining. At the beginning of 1949, only a few Donbass combines were in operation, while at present there are hundreds.

The productivity of the combines has increased 18 percent from the third quarter of 1949 to the third quarter of 1950. They achieved an average monthly productivity of 4,556 tons a month during 9 months of 1950, almost reaching the goal set for 1950, and considerably exceeding the productivity of cutting machines under the same conditions.

In 1948 - 1949, the VPM-1 cutting and loading machine was designed to mechanize coal loading at the mine face. Considerable progress along this line was achieved in 1949 - 1950, and by the end of 1950 coal loading at mine faces of sloping coal seams was approximately 20 percent mechanized. This figure represents 200 percent of that for 1940, when coal loading at the mine face amounted to only 0.1 percent.

The UKT combine, designed in 1950 to extract coal from the thin, sloping seams which supply coking coal for the metallurgical industry, has been extensively adopted in mines with the proper mining and geological conditions.

Moreover, a number of new machines will be created and tested in 1951. There is particular need for a combine to work seams 1.5-3.0 meters thick, characteristic of the Moscow Basin and some other coal basins of the country. A revised version of the Donbass combine was tried out in these coal seams during 1950, but experience has shown that a special machine will be more productive under these circumstances.

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Much attention is being paid to mechanizing the removal of coal from steeply dipping seams. The KKP-1 combine, which does the work of 20-25 miners, was tried out in such coal seams in 1950 and will be introduced in a number of mines in 1951.

To effect a more complete extraction of valuable coking coal from the thick, steeply dipping seams in the Kuzbass, and to prevent underground fires, a system of mining these seams with backfilling of the worked-out area has been developed. Backfilling, a very laborious process, is in urgent need of mechanization. With this goal in mind, hydraulic and pneumatic backfilling was introduced in the postwar period and the proper machinery for these processes constructed. This method will be greatly expanded in 1951, and, in addition, other efficient methods of working the thick, steeply dipping seams of the Kuzbass will be investigated.

Several types of loading machines were designed and introduced in coal mines from 1948 - 1950. Among these were the EMP-1 rock-loading machine for loading coal and rock during the cutting of horizontal and sloping drifts with a small cross section and with a slope of up to 12 degrees, and the UMP-1 for loading rock and coal in cutting two-way haulage drifts and cross sections. Before the war, the number of these machines in mines was very small, but now they are counted by the thousands. During 1950, more than 500 kilometers of development drifts were cut with the help of these machines. During 1951, these loading machines will be modernized on the basis of last year's experience, and the improved machines will be issued in large numbers.

The mechanization of drift cutting requires a drift-cutting combine which will both cut and load rock. Several types of these machines have been constructed and successfully tested. For example, the PK-2M combine, which is working in mines of the Moscow Basin, can, under favorable conditions, attain a rate of 300 meters a month in drift cutting.

The shaker conveyers which used to be employed for conveying coal had a low productivity, were unreliable, and restricted the productivity of the new machinery. In 1949 - 1950, various types of scraper conveyers were introduced into USSR mines. Noteworthy among these are the SKR-11 reversing conveyer, which not only mechanizes coal conveying, but also delivers mine timbers to the mine face, and the SKT conveyer, which has its working and idle parts arranged in a row on one surface instead of having one above the other, as in other conveyers. This permits a decrease in the height of the conveyer to 80 millimeters, so that it may be successfully used to convey coal in thin coal seams. In 1951, new, heavier, and longer conveyers will be designed which will be suitable for working with highly productive combines.

At one time, mine timbers were the only props employed in coal mines. At present, these have been partially replaced by wedge-shaped metal SGK supports. The merit of these consists in their durability and in the fact that they may be used several times. Hundreds of such props are being used at present in USSR mines and their use will be widely extended during 1951. Among other new types of metal props which have also been designed is the MOS organ-pipe prop, which facilitates roof control and, in a number of instances, makes it possible to convert to the less laborious type of roof control by caving.

During 1946 - 1950, mine railroad transport was reorganized. Light rails were replaced by heavier ones permitting reliable electric locomotive haulage, the roads were tamped with ballast, and maintenance of the roads and haulage drifts was improved. In 1950 alone, more than 1,000 kilometers of underground railroads received major repair and more than 500 kilometers of light rails were replaced with heavier rails. The total length of haulage railroads in mines of the Ministry of the Coal Industry exceeds 6,000 kilometers.

The rolling stock -- mine cars and electric locomotives -- was considerably modernized and improved in recent years. Condenser electric locomotives, operating on alternating current and not requiring complicated conversion installations, were designed for the first time in the world. New, heavy, electric locomotives with a traction force of 10 tons or above are being extensively used. The capacity of the mine car stock in the mines increased -- for example, in the Donbass in 1950, the capacity increased to 533 tons for each 1,000 tons extracted as against 350 tons in 1940, and the number of cars at one mine face rose in the same period from 52 to 70.

LONG-PILLAR MINING METHOD INCREASES

A. A. Uskov

Mining in the Rostovugol' Combine had reached a high degree of mechanization; cutting and conveying have been mechanized 100 percent, haulage 99 percent, including haulage by electric locomotive 71.2 percent, and loading coal at the mine face 27 percent.

While the continuous method of mining, the long-pillar method of mining along the strike of the seam, and twin drifts are employed in this combine's mines, the long-pillar method is applied to 29 percent of the combine's total mining. At present, it is used chiefly in the mines of the Nesvetayantratsit Trust, particularly in its largest mines, such as Mine No 5, Mine No 7, Zapadno-Kapital'naya Mine, and Mine imeni OGPU, whose output accounts for 30 percent of the combine's production.

Using this method of mining, the Nesvetayantratsit Trust exceeded its quota for coal output 10 percent and its labor productivity reached the prewar level, being at present 44 tons a month for each worker. Cutting and loading machines, consisting of coal- and rock-loading machines, heavy STR-30 scraper conveyers, and LKU-250 belt conveyers, account for 35 percent of the mechanized loading at the mine faces. The cutting of development drifts does not present great difficulties. With the assistance of the coal-loading machine, up to 100 meters of drift are completed in a month and a 500-meter field along the strike of the seam is prepared in 5-6 months.

The use of machinery is much more efficient in the employment of the long-pillar method. Belt and scraper conveyers are set up more carefully since they are installed before starting operations. In reverse extraction, the number of conveyers is gradually decreased. On the other hand, the continuous method of mining requires an increase in the number of scraper conveyers almost daily, since conveyers often become clogged with rock from the blasting of drifts and also break down entirely.

The volume of work in maintaining and repairing mine workings is considerably less when the pillar-method of mining is used. In the mines of the Nesvetayantratsit Trust, 670 workers are employed for the repair of workings, while in the mines of the Shakhtantratsit Trust, where the continuous method is used, 1,939 were thus employed. The Gukovugol' Trust, where the continuous method of mining is also in use, employs 375 persons for repair of workings, although the output of this trust is only one third that of the Nesvetayantratsit Trust. The geological conditions are identical in both cases. The length of mine workings in the Nesvetayantratsit Trust is 269 kilometers, while it is only 91 kilometers in the Gukovugol' Trust. This indicates that the Nesvetayantratsit Trust employs 2.5 persons

per kilometer, while the Gukovugol' Trust employs 4.1 persons per kilometer. Coal losses in the Nesvetayantratsit Trust amount to 9 percent, while those in the Gukovugol' Trust amount to as much as 15.8 percent.

By the end of 1950, 30 percent of mining in the Rostovugol' Combine was carried on by the long-pillar method and new measures are being taken to convert mines of the Gukovugol' Trust, the Nezhdannaya Mine, and the Ayutinskoye Mine Administration of the Shakhtantratsit Trust to the long-pillar method. It would be difficult to convert a number of mines now in operation in the near future, whereas the long-pillar method should be widely adopted in newly operated mines, even in cases where the seam being worked is not very thick (from .6-.7 meter or more).

In 1951, which must be regarded as a transitional period, a number of mines in the Shakhtantratsit, Gukovugol', and Gundorovugol' trusts will introduce the twin-drift method in place of the continuous method of mining. This will also lead to a decrease in coal losses and to an improvement in the technical indexes.

The long-pillar system makes possible an extensive introduction of roof control by complete caving. In the continuous method, partial backfilling is extensively adopted to preserve the haulage drifts. If complete caving is used in the continuous method, the supports of the haulage drifts are broken and, in places, entirely crushed, particularly in the case of secondary settling. This puts the mine face out of use for a long time and causes large expenditures of money and labor in restoring the workings. The long-pillar system makes possible extensive caving of the worked-out area at the mine face and consequently reduces the need for labor to maintain the drifts.

The long-pillar method is the best and most suitable for working sloping Donbass coal seams, including thin ones. Preparation of the mine field with the use of coal- and rock-loading machines does not encounter difficulties. Repair of workings is cheap, exploitation of mechanisms dependable, and labor productivity is high. All this is particularly important when mine faces and mines are converting to the new work schedule to complete a cycle each day.

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